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**[7590-01P]**

**NUCLEAR REGULATORY COMMISSION**

**[Docket No. 50-128; NRC-2015-0210]**

**Texas Engineering Experiment Station/Texas A&M University System**

**Nuclear Science Center Reactor**

**AGENCY:** Nuclear Regulatory Commission.

**ACTION:** Environmental assessment and finding of no significant impact; issuance.

**SUMMARY:** The U.S. Nuclear Regulatory Commission (NRC) is considering renewal of Facility Operating License No. R-83, held by the Texas Engineering Experiment Station/Texas A&M University System (TEES/TAMUS or the licensee) for the continued operation of its Nuclear Science Center (NSC or the facility) Training, Research, Isotope Production, General Atomix (TRIGA) reactor (NSCR or the reactor). The NRC is issuing an environmental assessment and finding of no significant impact associated with the renewal of the license.

**DATES:** The environmental assessment and finding of no significant impact are available as of **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

**ADDRESSES:** Please refer to Docket ID **NRC-2015-0210** when contacting the NRC about the availability of information regarding this document. You may obtain publicly-available information related to this document using any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2015-0210**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: [Carol.Gallagher@nrc.gov](mailto:Carol.Gallagher@nrc.gov). For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**  
You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to [pdr.resource@nrc.gov](mailto:pdr.resource@nrc.gov). For the convenience of the reader, the ADAMS accession numbers are provided in a table in the "Availability of Documents" section of this document.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

**FOR FURTHER INFORMATION CONTACT:** Geoffrey A. Wertz, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-0893; e-mail: [Geoffrey.Wertz@nrc.gov](mailto:Geoffrey.Wertz@nrc.gov).

## **SUPPLEMENTARY INFORMATION:**

### **I. Introduction.**

The NRC is considering renewal of Facility Operating License No. R-83, held by TEES/TAMUS, which would authorize continued operation of its NSCR, located in College Station, Brazos County, Texas. Therefore, as required by § 51.21 of Title 10 of the *Code of*

*Federal Regulations* (10 CFR), the NRC performed an environmental assessment. Based on the results of the environmental assessment that follows, the NRC has determined not to prepare an environmental impact statement for the renewed license, and is issuing a finding of no significant impact.

## **II. Environmental Assessment.**

### *Description of the Proposed Action*

The proposed action would renew Facility Operating License No. R-83 for an additional 20 years from the date of issuance of the renewed license. The proposed action is in accordance with the licensee's letter dated February 27, 2003, as supplemented by letters dated July 22, 2009; July 28, August 30, August 31, and December 9, 2010; May 27, June 9, and November 21, 2011; January 12, April 11, and November 14, 2012; January 31, 2013; February 3, February 11, and November 13, 2014; and March 2, June 5, June 11, and June 30, 2015 (the renewal application). In accordance with § 2.109, "Effect of timely renewal application," the existing license remains in effect until the NRC takes final action on the renewal application.

### *Need for the Proposed Action*

The proposed action is needed to allow the continued operation of the TEES/TAMUS NSCR to routinely provide teaching, research, and services to numerous institutions for a period of 20 years.

### *Environmental Impacts of the Proposed Action*

The NRC has completed its safety evaluation of the proposed action to issue a renewed TEES/TAMUS NSC Facility Operating License No. R-83 to allow continued operation of the TEES/TAMUS NSCR for an additional 20 years and concludes there is reasonable assurance that the licensee will continue to operate the TEES/TAMUS NSCR safely for the additional

period of time. The details of the NRC's safety evaluation will be provided with the renewed license that will be issued as part of the letter to the licensee approving its license renewal application. This document contains the environmental assessment of the proposed action.

The TEES/TAMUS NSC is located on a rectangular 6-acre site on the west end of the Texas A&M University (TAMU) campus in College Station, Texas. The NSC is located 460 meters (1500 feet) west of the north-south runway of Easterwood Airport. The NSC is surrounded by land owned and controlled by TAMU and Easterwood Airport. No industrial, transportation or military facilities within the vicinity of the NSC pose sufficient risk to the NSC NSCR to render the site unusable for operation of the reactor facility. Although the airport is nearby, the trajectory of the runways make the probability of a casualty resulting from an aircraft collision low. The NSCR is located within a steel and concrete confinement building, below ground level, and is protected by thick stainless steel-lined concrete pool walls, which would minimize the radiological risk of a potential aircraft collision.

The NSC is comprised of the reactor confinement building, entry/reception area, laboratory building and other equipment rooms, and storage/support buildings. The main entrance into the NSC is located at the east end of the site. The NSC is located 9.6 kilometers (6 miles) south of the city center of Bryan, 4.8 kilometers (3 miles) southwest of the TAMU main campus, and 4.1 kilometers (2.5 miles) west-southwest of the City of College Station. The nearest permanent residences are greater than 1 kilometer (0.6 miles) from the NSC and the nearest dormitories are 4 to 6 kilometers (2.5 to 3.5 miles) away.

The NSC is approximately 6 kilometers (3.5 miles) south of TAMU's Zachry Engineering Center complex. The Zachry Engineering Center is the location of TAMU's second research reactor, an Aerojet General Nucleonics (AGN)-201M research reactor (the AGN). The license for the AGN is currently under review for renewal which will also include an environmental assessment similar in nature to this environmental assessment for the NSC.

The NSCR is a pool-type, light water moderated and cooled TRIGA research reactor licensed to operate at a steady-state power level of 1.0 megawatt (thermal). The reactor is also licensed to operate in a pulse mode. The fuel is located at the bottom of a stainless steel-lined concrete pool, which has two sections with a total volume of 401,500 liters (106,000 gallons) of water. The main section of the pool is 10 meters (33 feet) deep and 5.5 meters (18 feet) wide. The stall section of the pool is 2.8 meters (9 feet) wide with a rounded end, which can be isolated from the main section of the pool by an aluminum gate. The reactor is fueled with standard TRIGA low-enriched uranium fuel and the core is normally covered by 8 meters (26 feet) of water. A detailed description of the reactor is publicly available and can be found in the Safety Analysis Report (SAR) for the NSCR. There have been two major modifications to Facility Operating License No. R-83 since the last renewal of the license on March 30, 1983. An order was issued in 2006 amending the license by: 1) allowing an increase in the possession limits for uranium-235 to bring a low-enriched uranium core on site for converting the reactor from the use of high-enriched uranium fuel to low-enriched uranium fuel (possession limits were reduced when the high-enriched uranium core was removed from the facility after conversion); and 2) converting the reactor from the use of high-enriched uranium fuel to low-enriched uranium fuel.

A. Radiological Impact.

Environmental Effects of Reactor Operations:

Gaseous radioactive effluents are discharged from the NSCR facility exhaust system through a single release point, a 26-meter (85 feet) high building stack, at a volumetric flow rate of approximately 233 cubic meters (8,000 cubic feet) per minute. The only significant radionuclide found in the gaseous effluent stream is argon-41 (Ar-41). The Ar-41 release rate for the NSCR is limited to 30 curies per year (Ci/yr), as required by TS 3.5.2.

The licensee states that all modes of operation at the NSCR, including thermal column operations, produce air concentrations and total Ar-41 release much less than the TS 3.5.2 limit of 30-Ci/yr. However, using the 30-Ci/yr TS 3.5.2 limit and the stack flow rate provided above, the licensee calculated that the average Ar-41 release concentration would be  $2.5 \times 10^{-7}$  microcuries per milliliter ( $\mu\text{Ci/mL}$ ), which is 8.3 percent of the derived air concentration (DAC) limiting value of  $3 \times 10^{-6}$   $\mu\text{Ci/mL}$ , established in Table 1 of appendix B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage," to 10 CFR part 20. Using the building concentration as the average stack flow concentration provided above, the licensee calculated the occupational dose to an NSC worker staying in the confinement for 2,000 hours per year at 416 millirem (mrem). The license also evaluated the dose to a worker given the assumption that the concentration of Ar-41, based on the 30 Ci/yr release limit, was generated during 2,000 hours of reactor operation and the resulting dose was 1.84 rem, which is well below the 5,000 mrem limit established in § 20.1201, "Occupational dose limits for adults."

The licensee calculated, using an atmospheric dilution factor of  $5 \times 10^{-3}$  for the distance to the fence line at 100 m (boundary of the restricted area), the potential dose to a member of the public to be 12.6 mrem for a continuous Ar-41 exposure over the entire year. This dose value is below the limit of 100 mrem/yr in § 20.1301, "Dose limits for individual members of the public." In order to ensure that the actual dose remains below the 10 mrem annual as low as is reasonably achievable (ALARA) constraint of § 20.1101, "Radiation protection programs," the licensee indicated that the Ar-41 releases are monitored monthly, and the Radiation Safety Officer (RSO) reviews the results of any abnormal releases to ensure that the Ar-41 doses remain below the 10 mrem ALARA constraint. Additionally, a review of the Ar-41 releases from the licensee's annual reports shows that the annual release of Ar-41 is well below the 30 Ci limit. The 2013 Annual Report, as supplemented, is publicly available and indicated that the

total release of Ar-41 was 10.4 Ci. The NRC estimates this release could result in a potential dose to a member of the public to be approximately 4.3 mrem over a year.

The licensee disposes of liquid radioactive wastes by discharge to the sanitary sewer. Liquid radioactive waste is collected from various locations within the facility and transferred to one of three 140,060 liters (37,000 gallons) hold-up tanks. When a tank is full, its contents are filtered to remove any particulates, and sampled for radioactive content. Procedures are used to control the discharge process to ensure that discharges meet the requirements of § 20.2003, "Disposal by release into sanitary sewerage," for disposal into the sanitary sewerage. For many years, the licensee discharged liquid waste from the hold-up tanks directly to a small creek running through the site. The waste was analyzed and sufficiently diluted before each release. Sampling of creek sediment was routinely done as part of the overall environmental monitoring program. In September 2008, the licensee reconfigured its liquid effluent system such that the hold-up tanks now discharge to the sanitary sewer. Since that time, no releases have been made to the creek and none are planned.

The licensee oversees the handling of solid low-level radioactive waste generated at the NSC. The bulk of the waste consists of gloves, paper, plastic, and small pieces of metal. The licensee disposes of the waste by decay-in-storage or shipment to a low-level waste broker in accordance with all applicable regulations for transportation of radioactive materials.

To comply with the Nuclear Waste Policy Act of 1982, the licensee has entered into a contract with the U.S. Department of Energy (DOE) that provides that DOE retains title to the fuel utilized at the NSC and that DOE is obligated to take the fuel from the site for final disposition.

As described in Chapter 11 of the publicly available NSC SAR, personnel exposures are well within the limits set by § 20.1201, "Occupational dose limits for adults," and are ALARA. The licensee tracks exposures of personnel monitored with dosimeters, which are usually less

than 10 percent of the occupational limit of 50 milliSieverts (5,000 mrem) per year. Area thermo-luminescent dosimeter (TLD) monitors mounted in the control room and other strategic locations provide an additional monthly measurement of total radiation exposures at those locations. No changes in reactor operation that would lead to an increase in occupational dose are expected as a result of the proposed action.

The licensee conducts an environmental monitoring program to assess the radiological impact of reactor operations on the surrounding areas. The program consists of measuring and recording the integrated radiation exposure obtained from environmental TLDs located at various positions around the site boundary and at two control locations away from any direct influence from the NSC. The licensee administers the program and maintains the appropriate records. Over the past five years, the survey program indicated that radiation exposures at the monitoring locations were not significantly higher than those measured at the control locations. Year-to-year trends in exposures are consistent between monitoring locations. Also, no correlation exists between total annual reactor operation and annual exposures measured at the monitoring locations. Based on its review of the past five years of data, the NRC staff concludes that operation of the NSC does not have any significant radiological impact on the surrounding environment. No changes in reactor operation that would affect off-site radiation levels are expected as a result of the proposed action.

#### Environmental Effects of Accidents:

Accident scenarios are discussed in Chapter 13 of the NSC SAR. The maximum hypothetical accident is the simultaneous loss of coolant and rupture of a single fuel element in air. The licensee conservatively calculated doses to facility personnel and the maximum potential dose to a member of the public. The NRC performed independent calculations to verify that the doses represent conservative estimates for the maximum hypothetical accident. Occupational doses resulting from this accident would be well below the 10 CFR part 20 annual



limit of 50 milliSievert (5.0 rem). Maximum doses for members of the public resulting from this accident would be well below the 10 CFR part 20 annual limit of 1.0 milliSievert (100 mrem).

The proposed action will not increase the probability or consequences of accidents.

The licensee has not requested any changes to the facility design or operating conditions as part of the application for license renewal. No changes are being made in the types or quantities of effluents that may be released off site. The licensee has systems in place for controlling the release of radiological effluents and implements a radiation protection program to monitor personnel exposures and releases of radioactive effluents. As discussed in the safety evaluation, the systems and radiation protection program are appropriate for the types and quantities of effluents expected to be generated by continued operation of the NSCR. Accordingly, there would be no increase in routine occupational or public radiation exposure as a result of license renewal. As discussed in the safety evaluation, the proposed action would not significantly increase the probability or consequences of accidents. Therefore, license renewal would not change the environmental impact of facility operation. The NRC evaluated information contained in the licensee's renewal application and reviewed data reported to the NRC by the licensee for the last five years of operation to determine the projected radiological impact of the facility on the environment during the period of the renewed license. The NRC found that releases of radioactive material and personnel exposures were all well within applicable regulatory limits. Based on its evaluation, the NRC concludes that continued operation of the NSCR would not have a significant environmental impact.

**B. Non-Radiological Impacts.**

The NSCR core is cooled by a light water primary system consisting of the reactor pool, a heat removal system, and a processing system. Cooling occurs by natural convection with the heated coolant rising out of the core and into the bulk pool water. The large heat sink provided by the volume of primary coolant allows several hours of full-power operation without

any secondary cooling. The heat removal system transfers heat to the secondary system via a heat exchanger. The secondary system uses water supplied by the municipal water system. The licensee monitors both systems for purity and to detect significant leakage. The licensee does not chemically treat the primary coolant. Three chemicals (sulfuric acid, sodium hypochlorite (bleach), and a commercial cooling water treatment) are used to maintain the secondary coolant pH, control growth of organisms, and control the buildup of scale, respectively. These chemicals are highly diluted and possess minimal hazards to the operating staff. Secondary cooling tower water is occasionally “blown-down” to maintain acceptable conductivity (purity), and the blow-down water is disposed of in accordance with the permit limits of the University’s waste water treatment plant. The licensee uses small volumes of standard laboratory-grade chemicals in their chemical laboratories. These chemicals are disposed through an established procedure with the University’s Environmental Health Office. The licensee implements a non-radiological environmental monitoring program with the Texas Department of State Health Services. This program helps to ensure that impacts are kept within acceptable limits.

Given that the proposed action does not involve any change in the operation of the reactor, the minimal heat load dissipated to the environment and limited chemical usage, the NRC concludes that the proposed action will not have a significant non-radiological impact on the environment.

#### National Environmental Policy Act Considerations:

The NRC has responsibilities that are derived from the National Environmental Policy Act and from other environmental laws, which include the Endangered Species Act (ESA), Coastal Zone Management Act, National Historic Preservation Act (NHPA), Fish and Wildlife Coordination Act (FWCA) and Executive Order 12898 – Environmental Justice. The following presents a brief discussion of impacts associated with these laws and other requirements.

1. Endangered Species Act

No effects on the aquatic or terrestrial habitat in the vicinity of the NSC, or to threatened, endangered, or protected species under the ESA, would be expected.

2. Coastal Zone Management Act

The NSC is not located within any managed coastal zone, nor would the effluents and emissions from the NSCR impact any managed coastal zones.

3. National Historic Preservation Act

The NHPA requires Federal agencies to consider the effects of their undertakings on historic properties. The National Register of Historic Places lists several historical sites in Brazos County. However, none of the sites are located within 1 kilometer (0.6 miles) of the NSC and, given their respective locations, continued operation of the NSCR will not impact any historical sites. The NRC staff contacted the State of Texas Historical Preservation Officer (SHPO) and discussed the proposed action. The SHPO indicated that there was no objection to the proposed action and that it did not require a formal review by that office. Based on this information, the NRC staff finds that the potential impacts of the proposed action would have no adverse effect on historic and archaeological resources.

4. Fish and Wildlife Coordination Act

With regard to the NSC, TEES/TAMUS is not planning any water resource development projects, including any modifications relating to impounding a body of water, damming, diverting a stream or river, deepening a channel, irrigation, or altering a body of water for navigation or drainage. Therefore, this action has no significant impact related to the FWCA.

5. Executive Order 12898 – Environmental Justice

The environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income

populations that could result from the relicensing and the continued operation of the NSC. Such effects may include human health, biological, cultural, economic, or social impacts.

Minority Populations in the Vicinity of the NSC - According to the 2010 census data, 36 percent of the total population (approximately 512,000 individuals) residing within a 50-mile radius of the NSC identified themselves as minority individuals. The largest minority were people of Hispanic, Latino, or Spanish origin of any race (approximately 100,000 persons or 19.5 percent), followed by Black or African American (65,000 or 12.7 percent). According to the U.S. Census Bureau, about 41 percent of the Brazos County population identified themselves as minorities, with persons of Hispanic, Latino, or Spanish origin comprising the largest minority group (23 percent). According to U.S. Census Bureau's 2013 American Community Survey 1-Year Estimates, the minority population of Brazos County, as a percent of the total population, had increased to about 42 percent.

Low-income Populations in the Vicinity of the NSC - According to the U.S. Census Bureau's 2008-2012 American Community Survey 5-Year Estimates, approximately 100,000 individuals (20 percent) residing within a 50-mile radius of the NSC were identified as living below the Federal poverty threshold. The 2012 Federal poverty threshold was \$23,492 for a family of four.

According to the U.S. Census Bureau's 2013 American Community Survey 1-Year Estimates, the median household income for Texas was \$51,704, while 13.6 percent of families and 17.5 percent of the state population were found to be living below the Federal poverty threshold. Brazos County had a lower median household income average (\$37,913) and a higher percent of families (16.1 percent) and individuals (29.5 percent) living below the poverty level, respectively.

Impact Analysis - Potential impacts to minority and low-income populations would mostly consist of radiological effects; however, radiation doses from continued operations associated

with the license renewal are expected to continue at current levels, and would be well below regulatory limits.

Based on this information and the analysis of human health and environmental impacts presented in this environmental assessment, the proposed license renewal would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of the NSC.

*Environmental Impacts of the Alternatives to the Proposed Action*

As an alternative to license renewal, the NRC considered denying the proposed action. If the NRC denied the request for license renewal, reactor operations at the NSC would cease and decommissioning would be required. The NRC notes that, even with a renewed license, the NSC will eventually require decommissioning, at which time the environmental effects of decommissioning would occur. Decommissioning would be conducted in accordance with an NRC-approved decommissioning plan which would require a separate environmental review under § 51.21, "Criteria for and identification of licensing and regulatory actions requiring environmental assessments." Cessation of reactor operations at the NSC would reduce or eliminate radioactive effluents and emissions. However, as previously discussed in this environmental assessment, radioactive effluents resulting from reactor operations are only a small fraction of the applicable regulatory limits. Therefore, the environmental impacts of renewing the license and the denial of the request for license renewal would be similar. In addition, denying the request for license renewal would eliminate the benefits of teaching, research, and services provided by the NSCR.

#### *Alternative Use of Resources*

The proposed action does not involve the use of any different resources or significant quantities of resources beyond those previously considered in the issuance of License Amendment No. 9 to Facility Operating License No. R-83 for the NSC dated March 30, 1983, which renewed the Facility Operating License No. R-83 for an additional period of 20 years.

#### *Agencies and Persons Consulted*

In accordance with the agency's stated policy, on June 11, 2010, the NRC staff consulted with the Texas State Liaison Officer regarding the environmental impact of the proposed action. The consultation involved a thorough explanation of the environmental review, the details of this environmental assessment, and the NRC's findings. The State official stated the he understood the NRC review and had no comments regarding the proposed action.

### **III. Finding of No Significant Impact.**

The NRC staff has prepared this EA as part of its review of the proposed action. On the basis of this EA, the NRC finds that there are no significant environmental impacts from the proposed action, and that preparation of an environmental impact statement is not warranted. On the basis of the environmental assessment included in Section II of this document, the NRC concludes that the proposed action will not have a significant effect on the quality of the human environment. Accordingly, the NRC has determined that a finding of no significant impact is appropriate.

### **IV. Availability of Documents.**

This finding and related environmental documents are available to interested persons through ADAMS via the following ADAMS accession numbers:

<b>Document</b>	<b>ADAMS Accession No. / Web link / <i>Federal Register</i> Citation</b>
February 27, 2003	ADAMS Accession No. ML102920025
July 22, 2009	ADAMS Accession No. ML092530306
July 28, 2010	ADAMS Accession No. ML102150544
August 30, 2010	ADAMS Accession No. ML102510154
August 31, 2010	ADAMS Accession No. ML102650318
December 9, 2010	ADAMS Accession No. ML103470278
May 27, 2011	ADAMS Accession No. ML111950372
June 9, 2011	ADAMS Accession No. ML111950376
November 21, 2011	ADAMS Accession Nos. ML113410067 and ML11327A083
January 12, 2012	ADAMS Accession No. ML120260016
April 11, 2012	ADAMS Accession No. ML12110A116
November 14, 2012	ADAMS Accession No. ML12321A321
January 31, 2013	ADAMS Accession No. ML13037A307
February 3, 2013	ADAMS Accession No. ML14038A106
February 11, 2013	ADAMS Accession No. ML14076A112
November 13, 2014	ADAMS Accession No. ML15009A297
March 2, 2015	ADAMS Accession No ML15065A068
June 5, 2015	ADAMS Accession No ML15160A023
June 11, 2015	ADAMS Accession No. ML15187A256
June 30, 2015	ADAMS Accession No. ML15182A449

Dated at Rockville, Maryland, this 24th day of August, 2015.

For the Nuclear Regulatory Commission

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